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SDN-NFV Lab 1

Part 1: Answers to those four questions

1. When ONOS activates “org.onosproject.openflow” what are the APPs which it also activates?

Ans:

當 ONOS activates “org.onosproject.openflow”,

下面這四個 Apps 會跟著被 activates

“org.onosproject.optical-model”

“org.onosproject.openflow-base”

“org.onosproject.lldpprovider”

“org.onosproject.hostprovider”

```
andy@root > apps -a -s                                                  06:14:
andy@root > app activate org.onosproject.openflow                       06:14:
Activated org.onosproject.openflow
andy@root > apps -a -s                                                  06:14:
*  15 org.onosproject.optical-model        2.2.0    Optical Network Model
*  27 org.onosproject.openflow-base        2.2.0    OpenFlow Base Provider
*  28 org.onosproject.lldpprovider         2.2.0    LLDP Link Provider
*  29 org.onosproject.hostprovider         2.2.0    Host Location Provider
*  36 org.onosproject.openflow             2.2.0    OpenFlow Provider Suite
andy@root >                                                             06:14:
```

2. Can H1 ping H2 successfully? Why or why not?

Ans:

h1 ping h2 不能 ping 成功

```
mininet> h1 ping h2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
From 10.0.0.1 icmp_seq=1 Destination Host Unreachable
From 10.0.0.1 icmp_seq=2 Destination Host Unreachable
From 10.0.0.1 icmp_seq=3 Destination Host Unreachable
^C
--- 10.0.0.2 ping statistics ---
6 packets transmitted, 0 received, +3 errors, 100% packet loss, time 5114ms
pipe 4
mininet>
```

因為沒有開啟 org.onosproject.fwd

```
andy@root > app activate org.onosproject.fwd
Activated org.onosproject.fwd
```

開啟之後就能夠 h1 ping h2

```
mininet> h1 ping h2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=15.8 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.152 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.040 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=0.095 ms
^C
--- 10.0.0.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3049ms
rtt min/avg/max/mdev = 0.040/4.046/15.897/6.842 ms
mininet>
```

3. Which TCP port the controller listens for the Openflow connection request from the switch?

Ans:

6653

全部 app 都 deactivate

```
andy@ubuntu:~$ netstat -tlp
(Not all processes could be identified, non-owned process info
 will not be shown, you would have to be root to see it all.)
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 ubuntu:domain           *:*                     LISTEN      -
tcp        0      0 *:ssh                   *:*                     LISTEN      -
tcp        0      0 localhost:ipp           *:*                     LISTEN      -
tcp        0      0 localhost:5005          *:*                     LISTEN      4237/java
tcp6       0      0 [::]:8181               [::]:*                  LISTEN      4237/java
tcp6       0      0 [::]:ssh                [::]:*                  LISTEN      -
tcp6       0      0 ip6-localhost:ipp       [::]:*                  LISTEN      -
tcp6       0      0 [::]:44444              [::]:*                  LISTEN      4237/java
tcp6       0      0 localhost:42241         [::]:*                  LISTEN      4237/java
tcp6       0      0 [::]:8101               [::]:*                  LISTEN      4237/java
tcp6       0      0 ip6-localhost:46373     [::]:*                  LISTEN      2041/bazel(onos)
tcp6       0      0 localhost:rmiregistry   [::]:*                  LISTEN      4237/java
tcp6       0      0 [::]:9876               [::]:*                  LISTEN      4237/java
andy@ubuntu:~$
```

全部 app 都 activate

```
andy@ubuntu:~$ netstat -tlp
(Not all processes could be identified, non-owned process info
 will not be shown, you would have to be root to see it all.)
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 ubuntu:domain           *:*                     LISTEN      -
tcp        0      0 *:ssh                   *:*                     LISTEN      -
tcp        0      0 localhost:ipp           *:*                     LISTEN      -
tcp        0      0 localhost:5005          *:*                     LISTEN      4237/java
tcp6       0      0 [::]:8181               [::]:*                  LISTEN      4237/java
tcp6       0      0 [::]:ssh                [::]:*                  LISTEN      -
tcp6       0      0 ip6-localhost:ipp       [::]:*                  LISTEN      -
tcp6       0      0 [::]:6653               [::]:*                  LISTEN      4237/java
tcp6       0      0 [::]:8101               [::]:*                  LISTEN      4237/java
tcp6       0      0 ip6-localhost:46373     [::]:*                  LISTEN      2041/bazel(onos)
tcp6       0      0 [::]:6633               [::]:*                  LISTEN      4237/java
tcp6       0      0 localhost:rmiregistry   [::]:*                  LISTEN      4237/java
tcp6       0      0 [::]:9876               [::]:*                  LISTEN      4237/java
andy@ubuntu:~$
```

4. In question 3, which APP enables the control to listen on the TCP port?

Ans:

org.onosproject.openflow-base

全部 app 都 activate

```
andy@ubuntu:~$ netstat -tlp
(Not all processes could be identified, non-owned process info
 will not be shown, you would have to be root to see it all.)
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 ubuntu:domain           *:*                     LISTEN      -
tcp        0      0 *:ssh                   *:*                     LISTEN      -
tcp        0      0 localhost:ipp           *:*                     LISTEN      -
tcp        0      0 localhost:5005          *:*                     LISTEN      4237/java
tcp6       0      0 [::]:8181               [::]:*                  LISTEN      4237/java
tcp6       0      0 [::]:ssh                [::]:*                  LISTEN      -
tcp6       0      0 ip6-localhost:ipp       [::]:*                  LISTEN      -
tcp6       0      0 [::]:44444              [::]:*                  LISTEN      4237/java
tcp6       0      0 [::]:6653               [::]:*                  LISTEN      4237/java
tcp6       0      0 localhost:42241         [::]:*                  LISTEN      4237/java
tcp6       0      0 [::]:8101               [::]:*                  LISTEN      4237/java
tcp6       0      0 ip6-localhost:46373     [::]:*                  LISTEN      2041/bazel(onos)
tcp6       0      0 [::]:6633               [::]:*                  LISTEN      4237/java
tcp6       0      0 localhost:rmiregistry   [::]:*                  LISTEN      4237/java
tcp6       0      0 [::]:9876               [::]:*                  LISTEN      4237/java
andy@ubuntu:~$
```

Deactivate org.onosproject.openflow-base 後 6653 不見了

所以是 org.onosproject.openflow-base

```
andy@ubuntu:~$ netstat -tlp
(Not all processes could be identified, non-owned process info
 will not be shown, you would have to be root to see it all.)
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 ubuntu:domain           *:*                     LISTEN      -
tcp        0      0 *:ssh                   *:*                     LISTEN      -
tcp        0      0 localhost:ipp           *:*                     LISTEN      -
tcp        0      0 localhost:5005          *:*                     LISTEN      4237/java
tcp6       0      0 [::]:8181               [::]:*                  LISTEN      4237/java
tcp6       0      0 [::]:ssh                [::]:*                  LISTEN      -
tcp6       0      0 ip6-localhost:ipp       [::]:*                  LISTEN      -
tcp6       0      0 [::]:44444              [::]:*                  LISTEN      4237/java
tcp6       0      0 localhost:42241         [::]:*                  LISTEN      4237/java
tcp6       0      0 [::]:8101               [::]:*                  LISTEN      4237/java
tcp6       0      0 ip6-localhost:46373     [::]:*                  LISTEN      2041/bazel(onos)
tcp6       0      0 localhost:rmiregistry   [::]:*                  LISTEN      4237/java
tcp6       0      0 [::]:9876               [::]:*                  LISTEN      4237/java
andy@ubuntu:~$
```

Part 2: Take screenshots and explain what you've done

Ans:

先建立 4 個 host

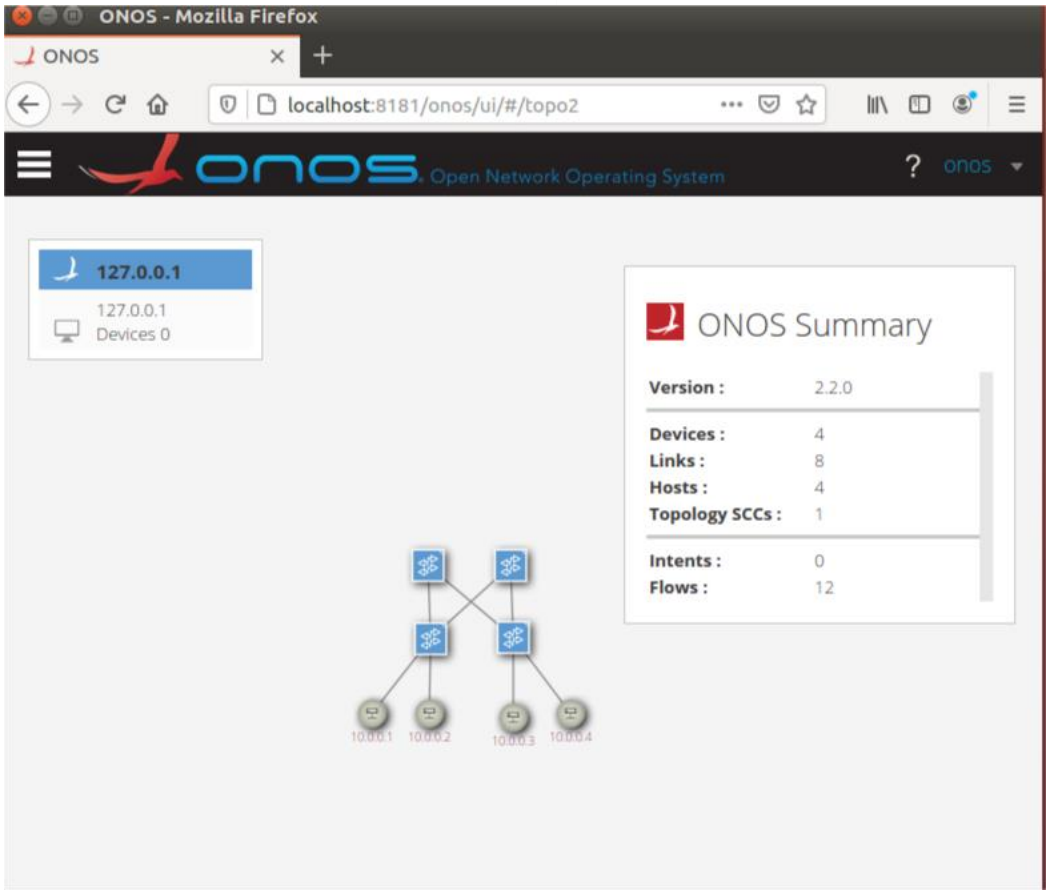
在建立 4 個 switch

接著建立 8 條連線

project1_L091197.py (~/onos) - gedit

Open

```
from mininet.topo import Topo

class Project1_Topo_L091197(Topo):
    def __init__(self):
        Topo.__init__(self)

        # Add hosts
        h1 = self.addHost("h1")
        h2 = self.addHost("h2")
        h3 = self.addHost("h3")
        h4 = self.addHost("h4")

        # Add switches
        s1 = self.addSwitch("s1")
        s2 = self.addSwitch("s2")
        s3 = self.addSwitch("s3")
        s4 = self.addSwitch("s4")

        # Add links
        self.addLink(h1,s1)
        self.addLink(h2,s1)
        self.addLink(h3,s2)
        self.addLink(h4,s2)
        self.addLink(s1,s3)
        self.addLink(s1,s4)
        self.addLink(s2,s3)
        self.addLink(s2,s4)

topos = {"topo_L091197": Project1_Topo_L091197}
```



```
andy@ubuntu:~/onos$ sudo mn --custom=project1_L091197.py --topo=topo_L091197 --controller=remote,ip=127.0
.0.1,port=6653
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3 h4
*** Adding switches:
s1 s2 s3 s4
*** Adding links:
(h1, s1) (h2, s1) (h3, s2) (h4, s2) (s1, s3) (s1, s4) (s2, s3) (s2, s4)
*** Configuring hosts
h1 h2 h3 h4
*** Starting controller
c0
*** Starting 4 switches
s1 s2 s3 s4 ...
*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2 h3 h4
h2 -> h1 h3 h4
h3 -> h1 h2 h4
h4 -> h1 h2 h3
*** Results: 0% dropped (12/12 received)
```

Bonus: Take screenshots and explain what you've done

Ans:

先建立 4 個 host

在建立 host 的同時使用 ip 來宣告 host 的 ip 和 netmask

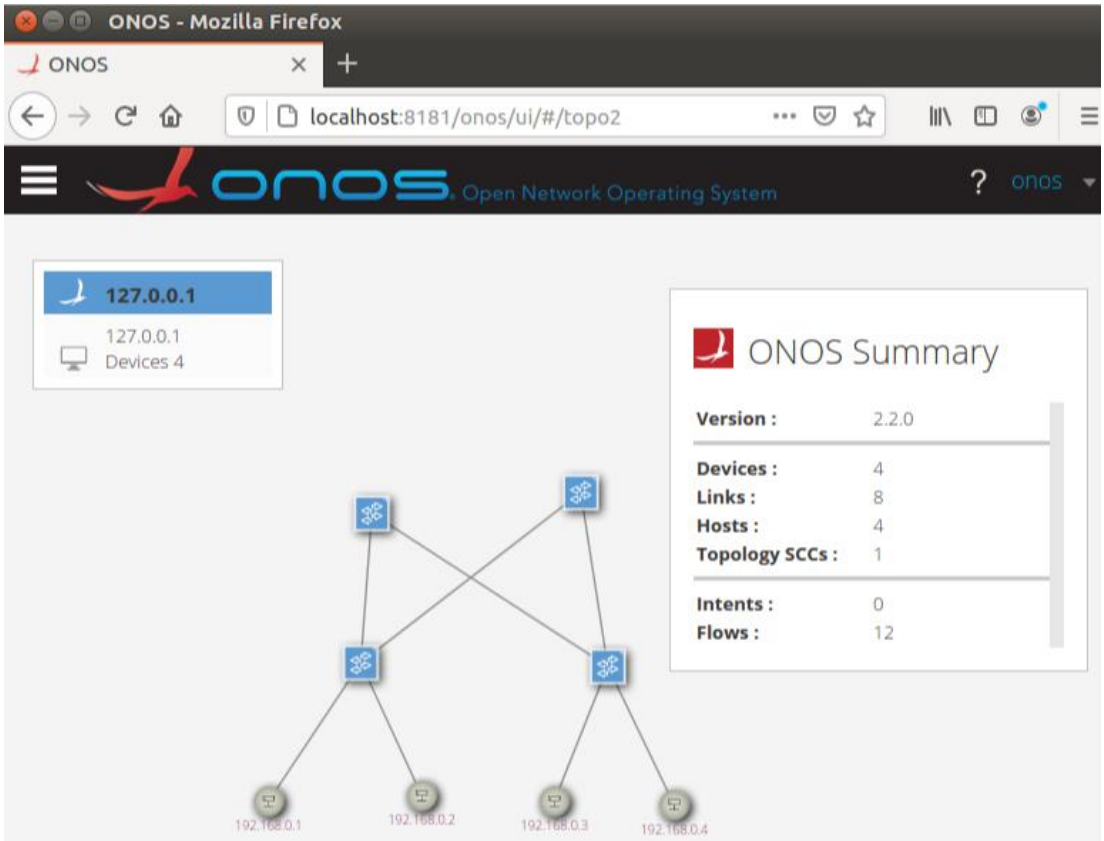
在建立 4 個 switch

接著建立 8 條連線

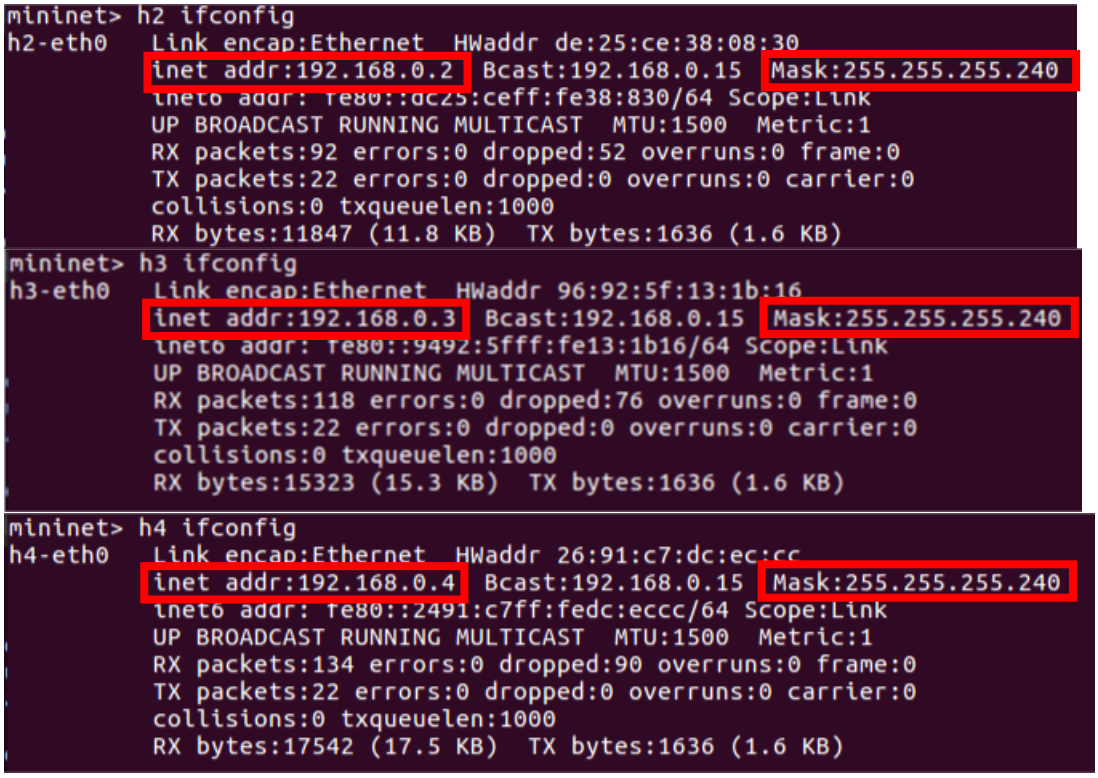
bonus_L091197.py (~/onos) - gedit

Open

```
from mininet.topo import Topo

class Project1_Topo_L091197(Topo):
    def __init__(self):
        Topo.__init__(self)

        # Add hosts
        h1 = self.addHost("h1", ip = "192.168.0.1/28" )
        h2 = self.addHost("h2", ip = "192.168.0.2/28" )
        h3 = self.addHost("h3", ip = "192.168.0.3/28" )
        h4 = self.addHost("h4", ip = "192.168.0.4/28" )

        # Add switches
        s1 = self.addSwitch("s1")
        s2 = self.addSwitch("s2")
        s3 = self.addSwitch("s3")
        s4 = self.addSwitch("s4")

        # Add links
        self.addLink(h1,s1)
        self.addLink(h2,s1)
        self.addLink(h3,s2)
        self.addLink(h4,s2)
        self.addLink(s1,s3)
        self.addLink(s1,s4)
        self.addLink(s2,s3)
        self.addLink(s2,s4)

topos = {"bonus_L091197": Project1_Topo_L091197}
```




```
andy@ubuntu:~/onos$ sudo mn --custom=bonus_L091197.py --topo=bonus_L091197 --controller=remote,ip=127.0
.1,port=6653
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3 h4
*** Adding switches:
s1 s2 s3 s4
*** Adding links:
(h1, s1) (h2, s1) (h3, s2) (h4, s2) (s1, s3) (s1, s4) (s2, s3) (s2, s4)
*** Configuring hosts
h1 h2 h3 h4
*** Starting controller
c0
*** Starting 4 switches
s1 s2 s3 s4 ...
*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2 h3 h4
h2 -> h1 h3 h4
h3 -> h1 h2 h4
h4 -> h1 h2 h3
*** Results: 0% dropped (12/12 received)
mininet>
mininet> h1 ifconfig
h1-eth0   Link encap:Ethernet  HWaddr da:df:aa:e3:ff:00
          inet addr:192.168.0.1  Bcast:192.168.0.15  Mask:255.255.255.240
          inet6 addr: fe80::d8df:aaff:fee3:ff00/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:56 errors:0 dropped:18 overruns:0 frame:0
          TX packets:20 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:6771 (6.7 KB)  TX bytes:1496 (1.4 KB)
```



What you've learned or solved

Ans:

Part 1 的第四小題

一開始想說把全部 app 都 deactivate 在一個一個 activate 看看身麼時候會出現 port,但是試了很多次都找不到,因為有些 app 會一起開起來.

後來改成先把所有 app 都 activate 一個一個 deactivate 後就找到了答案.